



AMERICAN
SURVEYING & ENGINEERING, P.C.

**CHICAGO RIVER BATHYMETRY
PROJECT REPORT
ASE PROJECT #213002**

DATE : MARCH 4, 2013

SUBMITTED BY

American Surveying & Engineering, P.C.

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Survey Report-

American Surveying & Engineering was contracted to provide bathymetric data detailing the existing conditions of the that part of the Chicago River lying on the North-Easterly side of Goose Island, from the North face of the Division Street Bridge South-Easterly along the river approximately 1800'.

Hydrographic Survey work on the Chicago River was performed using ASE's Survey Vessel the Abraham Lincoln, a 22' custom aluminum boat built by Scully's Boats. The survey was performed on January 30th, 2013 and utilized a Reson Seabat 7125 High Resolution Multi-beam Echosounder (MBE) and Edgetech's 4125 Side Scan Sonar (SSS) system. The Seabat 7125 is a single and/or dual frequency (200/400 kHz for a range of 500m/200m respectively) multi-beam echosounder system. The Edgetech 4125 Side Scan Sonar system utilizes 400 kHz/900 kHz simultaneous dual frequency full spectrum CHIRP technology and is equipped with on-board sensors which detect roll, pitch, heading and depth. It has a maximum range of 150 meters at 400 kHz and 75 meters at 900 kHz. Both the MBE and SSS sensors were mounted to a fixed side mount which is referenced to the center of gravity of the vessel and the water surface. Because site conditions were not optimal for using RTK GPS for data collection (specifically for MBE and SSS work), positions were provided using Differential GPS. Differential GPS utilizes dual mounted Trimble SPS852 receivers and an internal gyro which detects roll, pitch, and heading. River bottom elevations were determined depth measurements from the surface. This method of data collection works well in areas with bridges or other overhead obstructions which impair GPS signals. RTK GPS and differential leveling were used to establish and verify existing and new control points and benchmarks. Recovery forms were completed for two new site benchmarks on this project.

Survey lines were run along the river and spaced approximately eight feet apart for both MBE and SSS collection. This allowed for full coverage of the river bottom and provided significant overlapping areas. The areas of overlapping data were later compared against each other during post processing as an additional vertical check on the data collected. Comparison of overlapping data was used instead of a bar check due to the inability to maintain real-time GPS initialization.

For QA/QC purposes "pole check" shots were taken on the river bed using a Trimble R8 GPS receiver mounted on an extended rod using correction data provided by the Trimble VRSNow network. The rod was lowered from the front of the boat until resistance was met. Between check shots, when removing the rod from the river, it was noticed that the bottom consisted of a soft silt material. Though care was taken to set the bottom of the rod at the exact river bottom, it was observed that that the rod had sunk into the layer of soft silt as much as 1.5 feet. This was based on the amount of visible silt on the bottom of the rod in-between shots. This was then confirmed during post processing when the check shots were compared to the dtm produced from the MBE work. The resulting differences ranged between 0.116' and 1.204' vertically (check shots were lower in elevation than the dtm) which are in line with what field crews were

seeing in the field. Shots were also taken on the top of water throughout the project limits and found the average elevation of the river during the work to be at 575.79'.

Control Recovery Forms-

USACE Survey Marker Archive & Retrieval Tool Datasheet

Type: New

Designation: BM/HS-AME-203-CHI

Project: 213002 NRT CHICAGO RIVER

Stamping: BM/HS-AME-203-CHI CDO 1985

PID NGS: NA **COE:**

State: Illinois

County: COOK

District: Chicago

Nearest Town: CHICAGO

USGS Quad: LOOP

T.R.S.: T39N R14E S4

Nearest Hwy/Mi: I-90/I-94, 1.1 MILE

Date Recovered: 01/30/2013

By: AMERICAN SURVEYING & ENGINEERING

Condition/Stability: Good B

Setting/Monument Type: BRASS DISK

Owner: ACOE

GPS Suitable: ☒ Yes ☐ No

Obstructions: ☒ N ☐ E ☐ S ☐ W

Magnetic: ☐ Yes ☒ No



- Horizontal -

Datum: NAD83 (2011)

Lat: 41°54'01.3531" N

Lon: -087°38'46.1393" W

Local Accuracy: 2-cm

NSRS Accuracy: 2-cm

Survey/Computation Method:

RTK

Date Observed: 01/30/2013

- Vertical -

Datum: NAVD88 ()

Elevation Ht: 586.867 Ft

Ellip Ht:

Local Accuracy: 2-cm

NSRS Accuracy: 2-cm

Survey/Computation Method:

Geodetic Levels

Date Observed: 01/30/2013 Geoid09

Access:

- Tidal/Hydraulic Gage Relationships -

Owner: **Gage ID:** **- Elevation -** **- Datum -** **Epoch:**

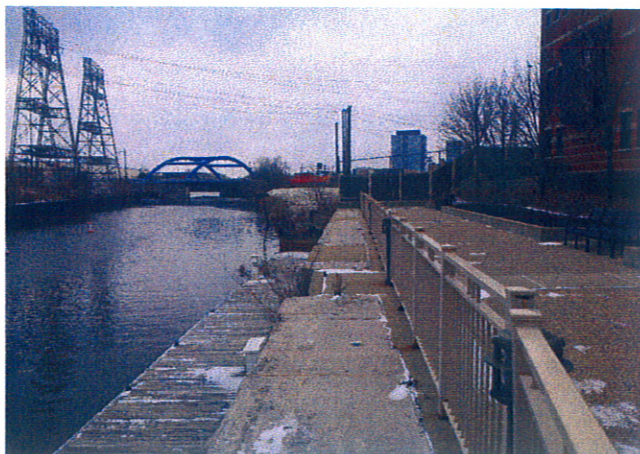
Description/Comments:

FOUND 3" BRASS ACOE DISK SET IN THE NORTH-EASTERLY SEA WALL ALONG THE CHICAGO RIVER AT GOOSE ISLAND. FROM THE INTERSECTION OF W HOBBLIE ST AND N CROSBY ST, HEAD SOUTH-WEST ALONG W HOBBLIE ST AND TURN LEFT AT N KINGSBURY STREET. HEAD SOUTH WEST THROUGH THE APARTMENT COMPLEX TO A CONCRETE WALK RUNNING ALONG THE CHICAGO RIVER. DISK IS LOCATED +- 90' S.S.E. OF THE NORTHERLY INTERSECTION OF THE CONCRETE WALK AND A WOODEN FENCE RUNNING ALONG THE NORTHERLY SIDE OF THE APARTMENTS, AND +- 2' SOUTH-WESTERLY OF A 4' IRON FENCE.

Zone 1: 1 EAST **Northing 1:** 1907036.12 **USFT Easting 1:** 1171326.80 **USFT Convergence 1:** **CSF 1:**

Zone 2: **Northing 2:** **USFT Easting 2:** **USFT Convergence 2:** **CSF 2:**

- Horizon/Setup View -



- Close-Up View -



Required Fields In Red

Submit

System Fields in Green

U-SMART ver 5.0
23 AUG 2012

User guidance for estimating local and network accuracy values

FGDC-STD-007.2-1998 Geospatial Positioning Accuracy Standards Part 2: Standards for Geodetic Networks

Local accuracy for horizontal and vertical geodetic control points is similar to the older accuracy methodology, since they are both methods to describe the relative accuracy between points. Hence, the older methodology can be converted into local accuracy by taking the average length of line, using the older defined accuracy of the points, and converting that into a value in meters.

Examples for horizontal and vertical surveys are:

- Second-order, class II horizontal survey (that is to say, 1:20,000) with average length line of 12,000 feet: $12,000 \times 1/20,000 = 0.600$ feet
- Second-order, class II leveling survey (that is to say, 8 millimeters per square-root of the distance in kilometers) with an average bench mark spacing of 1 mile (that is to say, 1.6 kilometers):
 $0.008 \times \text{SQRT}[1.6] = 0.01$ meters

Propagated Error Comp

Error1

Error2

P.Error

Network accuracy for horizontal geodetic control points can be estimated in two ways.

First, if the NAD 83 coordinates are consistent with the original NAD 83 adjustment, for example, the original NAD 83 (1986), then the network accuracy has been determined to seldom exceed 1.0 meters. Second, if the NAD 83 coordinates are the result of a statewide or regional High Accuracy Reference Network (HARN) adjustment, then the network accuracy has been determined to seldom exceed 0.05-0.1 meter. If better values have been determined for network accuracy for the area covered by the specific dataset, then those values should be used in place of these general values.

Vertical Accuracy:

Average Control Point Spacing (ft)

meters

feet

1st Order, Class I

0.000

0.000

1st Order, Class II

0.000

0.000

2nd Order, Class I

0.000

0.000

2nd Order, Class II

0.000

0.000

3rd Order

0.000

0.000

Horizontal Accuracy:

Average Line Distance (ft)

meters

feet

1st Order

0.000

0.000

2nd Order, Class I

0.000

0.000

2nd Order, Class II

0.000

0.000

3rd Order, Class I

0.000

0.000

3rd Order, Class II

0.000

0.000

USACE Survey Marker Archive & Retrieval Tool Datasheet

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Obstructions: ☒ N ☐ E ☐ S ☐ W

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Geodetic Levels

Date Observed: 01/30/2013 Geoid09

Access:

- Tidal/Hydraulic Gage Relationships -

Owner: **Gage ID:** **- Elevation -** **- Datum -** **Epoch:**

Description/Comments: FOUND 3" BRASS DISK SET IN CONCRETE WALK ALONG SEA WALL ON THE SOUTH-WESTERLY SIDE OF THE CHICAGO RIVER. TO REACH MONUMENT FROM THE INTERSECTION OF HALSTED ST AND DIVISION ST HEAD SOUTH ALONG HALSTED 0.25 MILES TO THE NORTHERLY ENTRANCE INTO A CTA BUS DEPOT. YOU WILL NEED TO PARK IN PARKING LOT AND WALK EAST ALONG THE NORTH LINE OF THE PROPERTY UNTIL YOU REACH THE CHICAGO RIVER. MONUMENT IS SET ON THE CONCRETE WALK +/- 2.0 FEET WEST OF THE SEA WALL AND +/- 2.5' SOUTH OF THE NORTHERLY END OF THE WALK.

Zone 1: IL EAST **Northing 1:** 1906876.68 **USFT** **Easting 1:** 1171271.55 **USFT** **Convergence 1:** **CSF 1:**

Zone 2: **Northing 2:** **USFT** **Easting 2:** **USFT** **Convergence 2:** **CSF 2:**

- Horizon/Setup View -



Required Fields In Red

- Close-Up View -



System Fields In Green

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meters feet

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0.000

0.000

1st Order, Class II

0.000

0.000

2nd Order, Class I

0.000

0.000

2nd Order, Class II

0.000

0.000

3rd Order

0.000

0.000

Horizontal Accuracy:

Average Line Distance (ft)

meters feet

1st Order

0.000

0.000

2nd Order, Class I

0.000

0.000

2nd Order, Class II

0.000

0.000

3rd Order, Class I

0.000

0.000

3rd Order, Class II

0.000

0.000